Exemption No. 7341

UNITED STATES OF AMERICA
DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
RENTON, WASHINGTON 98055-4056

In the matter of the petition of

Avcon Industries Inc.

for an exemption from § 25.857(e)(4) of Title 14, Code of Federal Regulations

Regulatory Docket No. 30010

GRANT OF EXEMPTION

By letter of April 17, 2000, Mr. Larry W. Franke, President, Avcon Industries Inc., P.O. Box 748, City County Airport, Newton, Kansas, 67114, petitioned for an exemption from the requirements of § 25.857(e)(4), of Title 14, Code of Federal Regulations (14 CFR). Additional information was submitted by Avcon in a letter dated July 26, 2000. The proposed exemption, if granted, would exempt Learjet Models 20 and 30 series airplanes, modified for the carriage of cargo, from the requirement to exclude hazardous quantities of smoke, flames, or noxious gases from the flight crew compartment.

The petitioner requests relief from the following regulation:

> **Section 25.857(e)(4)**, states: A Class E cargo compartment is one on airplanes used only for the carriage of cargo and in which there are means to exclude hazardous quantities of smoke, flames, or noxious gases, from the flight crew compartment.

Related Sections of the Federal Aviation Regulations (FAR):

> **Section 25.831(e)** states: Except as provided in paragraph (f) of this section, means must be provided to enable the occupants of the following compartments and areas to control

the temperature and quantity of ventilating air supplied to their compartment or area independently of the temperature and quantity of air supplied to other compartments and areas:

(1) The flight crew compartment.

(2) Crewmember compartments and areas other than the flight crew compartment unless the crewmember compartment or area is ventilated by air interchange with other compartments or areas under all operating conditions.

The petitioner's supportive information is as follows:

"In accordance with FAR 11.25, Avcon Industries, Inc. hereby petitions the Federal Aviation Administration for exemption from the requirements outlined in FAR 25.857(e)(4), relating to the requirement for excluding hazardous quantities of smoke, flames or noxious gases from the flight crew compartment. This Request for Exemption is for Lear 20 and 30 series aircraft to be modified by Avcon Industries for the carriage of cargo, as outlined in Supplemental Type Certificate (STC) Project Number ST1543WI-T.

"BACKGROUND

"As you are aware, Avcon has been attempting to certify a Learjet Class E cargo compartment for an extended period of time, based upon our understanding and interpretation of the Federal Aviation Regulations and applicable Advisory Circulars. Our efforts to obtain an STC have been unsuccessful, due in part to the following items:

"FAR 25.857(e)(4) does not specifically define what constitutes hazardous quantities of smoke, fire and/or noxious gases.

"Advisory Circular (AC) 25-9A appears contradictory, since paragraph 11e(4)(i) states that 'wisps of smoke that enter and immediately exit at the occupied compartment boundaries are acceptable as long as a light haze or stratified haze does not form' (i.e., some smoke is allowed), while the testing requirements outlined in e(7)(iii) states that 'The transmissibility level in any occupied compartment should not be less at any time during the test than it was before the start of the tests' (i.e., no smoke is allowed).

"FAR 25.831(e) outlines the requirement for separate ventilating and heating air systems for the cockpit and other compartments, except when the total volume for the cockpit and passenger compartments is 800 cubic feet or less (as outlined in paragraph § 25.831(f). Avcon has interpreted this exception to include the Learjet, as the Lear 20 and 30 series cabins fall within the 800 cubic feet or less exception outlined in paragraph (f).

"Confusion within the industry relating to the issuance of, and subsequent amendments to Handbook Bulletin 98-12.

"The delays encountered in obtaining an STC have negatively impacted Avcon and its customers in several ways. It has created a lack of confidence in Avcon within the air cargo industry due to our perceived inability to complete the project, resulted in a loss of conversion business to Avcon, and at least partially led to the financial insolvency of an Avcon Learjet cargo customer (Pacific Air Transport).

"In an attempt to meet FAR 25 and applicable AC requirements to the fullest extent possible, Avcon is now petitioning the FAA to exempt the Learjet from the requirements pertaining to the exclusion of hazardous quantities of smoke, flames, or noxious gases from the flight crew compartment, outlined in FAR 25.857(e)(4).

"NATURE & EXTENT OF RELIEF SOUGHT

"Avcon's interest in this petition is to be able to offer a Class E cargo compartment to air cargo operators, which fulfills the expectations of our customers and is in compliance with Federal Aviation Regulations to the maximum extent possible.

"It is important to note that Learjet 20 & 30 series aircraft were all designed and FAA approved under the same Type Certificate (A-10CE). The environmental control system (ECS) for these various models of aircraft is essentially the same, in that there is only one air ventilating system, which serves to condition and pressurize the air for the entire cabin during flight. An outflow valve for the ECS is located on the forward pressure bulkhead, and a safety valve is located on the aft bulkhead. The outflow valve controls and maintains the desired pressure within the cabin. Air flows from the aft passenger compartment forward through the cabin to the cockpit, and exits the aircraft through the outflow valve. The unique design of the Learjet 20 & 30 series environmental control system, coupled with the relatively small size of the aircraft, precludes the installation of separate ventilating and heating air systems for the cockpit and other compartments, as addressed by FAR 25.831(e). The design also precludes the total elimination of hazardous quantities of smoke, flames or noxious gasses from the cockpit under all possible operating conditions without a total re-design of the ECS, which is not economically feasible.

"By receiving a partial exemption to the requirements of 25.857(e)(4), Avcon will be able to provide air cargo operators with a Class E cargo compartment that is in compliance, and offers a high degree of safety to the flight crew during emergency situations.

"DESCRIPTION OF EACH AIRCRAFT TO BE COVERED

"Avcon Industries requests that this exemption be applicable to the aircraft listed below:

Lear 24, 24B, 24C, 24D, 24E, 24F
Lear 25, 25B, 25C, 25D, 25G
Lear 35, 35A, 36, 36A

"Note: The Lear 23 has been excluded from this petition for Exemption because it is certified under FAR Part 23.

"INFORMATION IN SUPPORT OF THE PETITION

"Over the past few years, it has become increasingly obvious to the FAA and industry that a standardized cargo compartment is needed for Learjet operators flying freight, cargo or cancelled checks for hire. There are a wide variety of cargo configurations currently being utilized by operators, the majority of which were installed and/or field approved at the local level, without benefit of an STC. While we are not aware of any accidents attributable to the lack of standardization, it has created an ongoing problem for the FAA and industry because of different interpretations of the regulations in various regions and/or districts of the FAA.

"Handbook Bulletin (HBAW 98-12) was issued by AFS-300 in 1998, addressing the lack of standardization and non-compliance of certain aircraft modified to carry cargo. The Bulletin and subsequent revisions outlined deficiencies, future requirements and compliance dates. The Handbook Bulletin and subsequent revisions created uncertainty in the air cargo industry, and again pointed out the need for an approved STC solution."

Avcon Industries realized several years ago that an opportunity existed to provide an STC solution to cargo operators. On December 2, 1996, Avcon applied for an STC to design, test and certify a Class C cargo compartment for Learjet 20 & 30 series aircraft. After several meetings and discussions with the FAA relating to the fire extinguishing requirements of a Class C compartment and other issues that were addressed in HBAW 98-12, Avcon revised its application to a Class E cargo compartment in October, 1998. Since that time, Avcon has been meeting with the FAA and making minor modifications to the original design, in an attempt to gain concurrence from the FAA that our proposed Class E design is acceptable.

Avcon was advised by the FAA that the proposed design did not meet literal compliance with the FAR's, due to the requirement to exclude hazardous quantities of smoke, flames, or noxious gases from the flight crew compartment. Avcon is now requesting a partial exemption from the requirements of FAR 25.857(e)(4), in accordance with FAR 11.25. If granted, this partial exemption would allow Avcon to move forward with the modification, conformity, and testing of its proposed Class E cargo compartment design.

"COMMENTS IN THE PUBLIC INTEREST

"Business aircraft are far different in design and complexity than the carriers of the general public (i.e.: commercial airliners). Airliners are equipped with several different compartments for cargo, baggage and passengers. They are also equipped with two or more ventilating systems for the various compartments. It is therefore relatively easy to isolate certain compartments as Class E cargo compartments, without adversely affecting the safety of other compartments.

"Conversely, business aircraft typically have only one ventilating system that is used for pressurizing and heating the entire aircraft. The external skin, forward bulkhead and aft

bulkhead serve as the pressure boundary for the entire cabin, including the cockpit. The outflow valve is located either in the front or back of the aircraft, and again serves to regulate pressurization of the entire cabin, including the cockpit.

"Despite the fact that most business aircraft are not able to meet the literal compliance requirements of FAR 25.857(e)(4), it is in the public's best interest to have an STC that meets the requirements to the greatest extent possible.

"1. Certain FAR 25 certified aircraft, and Learjet 20 and 30 Series Aircraft in particular, are used extensively to facilitate the rapid movement of cancelled checks for the Federal Reserve and other banking institutions. The entire banking industry relies on the overnight movement of cancelled checks, which annually saves millions of dollars in interest expense. Cargo configured aircraft like the Learjet are also utilized to transport parts and materials for the automotive and other industries to maximize just-in-time inventory control, to fly expensive replacement parts to remote locations to repair machinery, and numerous other specialized missions. By dedicating aircraft to these specific missions, flexible schedules and routings can be maintained to ensure timely deliveries, rather than relying on scheduled carriers. The Learjet is ideal for these missions, due to its high speed, high altitude capability, dependability, and relatively low acquisition and operating costs.

"2. The projected expense to modify Learjet 20 and 30 Series Aircraft per an approved Class E cargo compartment is economically viable for most Learjet operators. The modification cost per aircraft is estimated to be $125,000, which could vary depending on the final approved configuration. Using a conservative financing cost of one percent per month, the approved cargo modification would add $1,250 per month to the aircraft debt service, which is $12.50 per flight hour, based on a utilization of 100 revenue flight hours per month. While this does place an additional financial burden on operators, the applicant does not feel that it will result in an undue hardship.

"3. The petitioner does not feel that it is economically practical to attempt to design a second Environmental Control System (ECS) for the Lear 20 & 30 Series aircraft. The cost to certify a second ECS would probably exceed two hundred fifty thousand dollars ($250,000). Extensive engineering and analysis would need to be performed on the existing aircraft ECS design and fuselage structure to determine the feasibility of a second ECS in an aircraft the size of a Learjet. Once feasibility was established, the new system would need to be designed, manufactured, installed, conformed and tested. There would also be numerous certification issues to deal with, since the design and original certification basis of the existing ECS is over 25 years old.

"Once approved by the FAA, the recurring costs for installation of a second ECS could range from $75,000 to $100,000 per aircraft, depending on the final approved configuration. This installation estimate does not include NRE recovery, which would be spread over the first twenty units, at approximately $12,500 per unit.

"Based on the cost estimates outlined above, the addition of a second ECS could therefore add $87,500 to $112,500 to the total cost of a Class E Cargo Compartment on Learjet 20 & 30 Series aircraft. This is an increase of 70% to 90% over the estimated Class E cargo installation price of $125,000, outlined under 2. above. The additional cost could prove to be a financial liability for many air cargo operators.

"4. With the exception of the Lear 23, of which few remain flying in a cargo configuration, all Learjet 20 and 30 series models are part 25 aircraft. The FAR's pertaining to air cargo operations under part 25 are far more stringent than for aircraft manufactured under part 23. Therefore, the more stringent requirements could potentially force many operators to investigate the use of older part 23 aircraft, if an economically viable STC solution is not made available for light jets, including the Learjet. By allowing a partial exemption from toxic levels of smoke in the cockpit, modification costs for a Class E cargo compartment can be economically viable, ensuring that most operators will continue to utilize safer part 25 aircraft for the carriage of air cargo.

"The proposed Avcon Class E cargo compartment offers full compliance in all other areas, including the requirement for a secondary means of emergency escape for the flight crew.

"Granting a partial exemption will clear the way for an approved STC that will help standardize many previously modified cargo aircraft, and ensure that new aircraft entering the air cargo fleet are modified to approved STC standards.

"SAFETY ENHANCEMENT

"The proposed Avcon Class E cargo compartment will provide a level of safety for the aircrew that is not currently available to operators of Learjet aircraft modified for the carriage of cargo. The combination of barrier nets, a smoke curtain, a smoke detection system, supplemental oxygen breathing equipment and a forward emergency escape window serve to provide maximum protection, consistent with the inherent design of the aircraft.

"Avcon intends to restrict the intrusion of hazardous quantities of smoke, flames and/or noxious gases to the cockpit area in several ways, including:

"1. Shutting off the air ducts to the aft cabin in the event of smoke, flames and/or noxious gases, and redirecting all ventilated air directly into the cockpit area. This will meet the requirements outlined in FAR 25.857(e)(3), and also help restrict the movement of air forward from the aft cabin to the cockpit. When all ventilated air bypasses the aft cabin and is redirected to the cockpit though overhead outlets, a constant supply of conditioned air is introduced into the flight crew area above and behind the pilots. This re-directed airflow will force any smoke that may enter the cockpit downward toward the outflow valve, eliminating stratification and helping to ensure that adequate flight visibility is maintained for the flight crew.

"2. Attaching a Smoke Curtain to the forward barrier net and surrounding metal cargo liner, which will effectively restrict the forward movement of hazardous quantities of smoke, flames and/or noxious gases to the cockpit area. The smoke curtain and forward barrier net will be located approximately four (4) feet aft of the flight crew to allow a clear path for emergency egress, if required.

"3. Providing full-face oxygen masks for the crew, to ensure both eye and breathing protection in the event of smoke intrusion into the cockpit.

"4. Providing an Approved Flight Manual Supplement (AFMS) that includes Emergency Procedures to be followed in the event the smoke detection system is activated and/or smoke enters the cockpit area.

"By providing a high degree of protection for the flight crew, Avcon will ensure that public safety is also enhanced. There is greater probability that flight crews encountering an emergency situation involving smoke or fire in the cargo compartment will be able to safely descend and land at a suitable airport without further incident. This will help protect the aircraft, aircrew and any potential obstacles in its flight path."

A summary of the petition was published in the Federal Register on June 6, 2000 (65 FR 35989). No comments were received.

The Federal Aviation Administration's analysis/summary is as follows:

The petitioner's statements are addressed in the order that they were presented in their petition for exemption.

BACKGROUND

1. The FAA concurs that § 25.857(e)(4) does not specifically define what constitutes hazardous quantities of smoke, fire and/or noxious gases. However, the reasons are documented in AC 25-9A, "Smoke Detection, Penetrating, and Evacuation Tests and Related Flight Manual Emergency Procedures," paragraphs 11.a.(2) and Appendix I, page 2, and read as follows:

"Par. 11.a.(2) Except noted in paragraph 11.e.(4) below, any penetration of smoke into occupied compartments from cargo, storage, or baggage compartments, equipment bays, equipment cooling systems, or other non-continuously occupied areas (e.g., galleys, lavatories, or crew rest areas) during the tests is unacceptable because the toxicity of the smoke is unpredictable and the smoke exposure might continue or increase to a hazardous level before a landing can be made."

"Compliance with § 25.857(b)(2), (c)(3), (d)(2) and (e)(4). One method of showing there are means of excluding hazardous quantities of smoke and extinguishing agent would be to define all the probable combustion sources within the cargo compartment and combinations of combustible byproducts combined with and without the extinguishing agent, and show that the possible exposure concentrations of these byproducts and extinguishing agents will not exceed human tolerances. In addition to the complexity of trying to define the probable combinations of combustion byproducts and extinguishing agent, the human tolerance to various concentrations of combustion byproducts and extinguishing agent has not been defined. For these reasons, this approach to compliance with § 25.857(b)(2), (c)(3), (d)(2) and (e)(4) has not been attempted."

"The AC identifies one means of compliance, but not the only means of compliance, that the FAA has found to be acceptable. The applicant may propose an alternate means of compliance for FAA's consideration and acceptance." In light of above information, the FAA does not concur that this has contributed to the applicant's lack of success in obtaining an STC."

2. The FAA does not concur that AC 25-9A appears contradictory. The title of 11.e.(7) reads "An Alternate Technique to Determine Smoke Penetration" under Step (4) above: (Exceptions (i), (ii), and (iii) still apply). Obviously, the exception 11.e.(4)(i), allowing "wisps of smoke…form", also applies to 11.e.(7)(iii). Therefore, the FAA does not concur that this has contributed to the applicant's lack of success in obtaining an STC.

3. The FAA concurs with the applicant's interpretation of § 25.831(e) and (f) as they apply to Lear 20 and 30 series aircraft certified as passenger airplanes. It is the conversion of that passenger cabin into a Class E cargo compartment (a new configuration compared to the certified type design) which requires compliance with § 25.857(e)(4) that the applicant has difficulty meeting. The FAA does not concur that this interpretation has contributed to the applicant's lack of success in obtaining an STC.

4. The FAA concedes that the Handbook Bulletin 98-12 and subsequent revisions created uncertainty in the air cargo industry, and that there exists the need for an approved STC solution, especially in light of various field approvals granted on various other Learjet airplanes. The Handbook Bulletin has since been cancelled.

NATURE & EXTENT OF RELIEF SOUGHT

The petitioner's proposal is to offer a Class E Cargo Compartment to Air Cargo Operators that:

1. Meets the applicable regulations vis-à-vis § 25.857(e)(4) to the maximum extent possible;

2. Substantially meets the requirements of § 25.857(e)(4) so that in case of smoke or fire, entry of hazardous quantities of smoke, flames, and/or noxious gases into the flight crew compartment is minimized but not completely excluded by

a. modifying the ventilation system to redirect all air to the cockpit only and

b. installing a smoke curtain to the forward barrier net and the cargo liner to restrict the forward movement of smoke/fire; and

c. Meets all other applicable regulations for a Class E cargo Compartment

The FAA concurs that by implementing the proposed design changes Avcon should substantially meet the intent of the applicable regulations but not literally comply.

DESCRIPTION OF EACH AIRCRAFT TO BE COVERED

The FAA is cognizant of the coverage requested for various Learjet Models listed earlier under this title.

INFORMATION IN SUPPORT OF THE PETITION

The FAA concurs that a standardized certification criteria for issuing STC's for converting Learjet and other similar airplanes from passenger to cargo configuration is necessary.

COMMENTS IN THE PUBLIC INTEREST

The FAA agrees that the business aircraft are different in design and complexity than the commercial airliners; however, the FAA does not concur that it is not feasible to design a second ventilating system for the cockpit of business aircraft. The argument presented is strictly an economic one and of interest to the applicant and/or operators. The FAA concedes that from the public interest point of view the usage of certain Part 25 aircraft such as Learjet 20 and 30 series is necessary for on time delivery of parts and equipment, and that it is better to establish a standard STC procedure including applicable exemption(s) than previous field approvals. The FAA agrees that the proposed Avcon Class E Cargo Compartment STC criteria substanitally meets the intent of the requirements of § 25.857(e)(4) and does offer full compliance in all other areas.

SAFETY ENHANCEMENT

The FAA concurs that the combination of barrier nets, a smoke curtain, a smoke detection system, supplemental oxygen breathing equipment, a forward emergency escape window, and an approved Airplane Flight Manual Supplement (AFMS) for emergency procedures

to be followed in case of smoke detection or entry into the cockpit, restricts the intrusion of hazardous quantities of smoke, flames, and/or noxious gases to the cockpit. This design provides an acceptable level of safety, and is an enhancement of safety over the field approval method.

In consideration of the foregoing, I find that a grant of exemption would be in the public interest. Therefore, pursuant to the authority contained in 49 U.S.C. §§ 40113 and 44701, delegated to me by the Administrator (14 CFR § 11.53), Avcon Industries Inc. is hereby granted an exemption from 14 CFR § 25.857(e)(4) to the extent necessary to permit supplemental type certification of the Learjet Models 20 and 30 series airplanes, modified for the carriage of cargo, to exclude hazardous quantities of smoke, flames, or noxious gases from the flight crew compartment. All test results pertinent to this exemption must be documented in a report and a copy provided to this office.

Issued in Renton, Washington, on September 5, 2000.

/s/ Donald L. Riggin
Donald L. Riggin
Acting Manager
Transport Airplane Directorate
Aircraft Certification Service, ANM-100